

# DARWIN-HC: A Tool to Predict Hot Corrosion of Nickel-Based Turbine Disks, Phase I

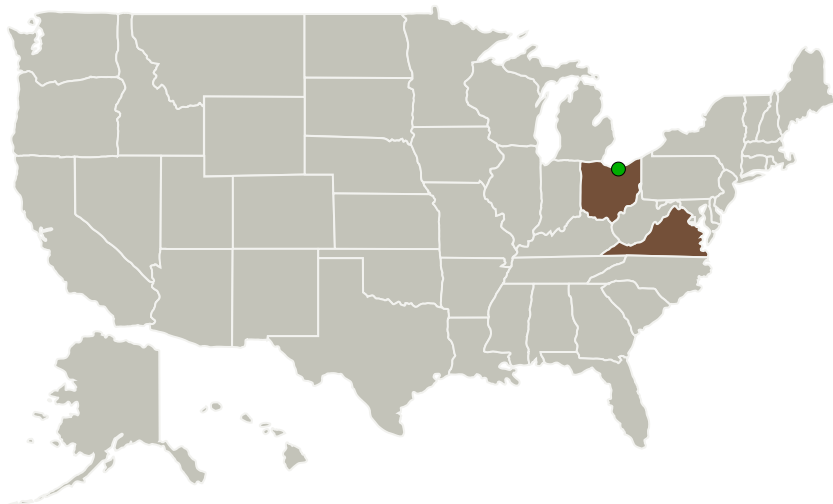
Completed Technology Project (2010 - 2010)



## Project Introduction

Hot Corrosion of turbine engine components has been studied for many years. The underlying mechanisms of Type I Hot Corrosion and Type II Hot Corrosion are increasingly well-understood. Nickel-based superalloys have shown strong resistance to high temperature oxidation attack and, of course, excellent high temperature strength. Modern turbine engine designs that seek to achieve better fuel efficiency in part by increasing turbine inlet temperatures are strong candidates for nickel-based superalloy turbine disk materials. As disk temperatures approach 700C, designers must consider the likelihood and effects of Type II corrosion. Type II corrosion is typically characterized by localized corrosion pitting caused by melting of sulfur-containing salts. Type II hot corrosion pits have been shown to decrease the fatigue resistance of superalloys due to initiation of fatigue cracks at hot corrosion pits. However, the rigorous analytical models and tools needed by turbine engine designers to predict Type II corrosion pit formation and fatigue life degradation due to corrosion pits are not currently available. Barron Associates, Inc. and its research partners propose to develop corrosion pitting and fatigue life models for nickel-based superalloys subjected to Type II hot corrosion. The models will be commercialized and made available to the research and development community.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Barron Associates, Inc.	Lead Organization	Industry	Charlottesville, Virginia
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

## Project Transitions

**January 2010:** Project Start

**July 2010:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139918>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Barron Associates, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

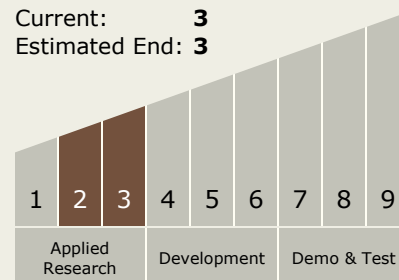
Carlos Torrez

### Principal Investigator:

Jason Burkholder

## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX13 Ground, Test, and Surface Systems
  - └ TX13.2 Test and Qualification
    - └ TX13.2.1 Mechanical/Structural Integrity Testing

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System